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## REMARKS

The present invention is to a inkjet recording medium that is made in a certain manner. To make the inkjet recording medium, a binder is applied to a base material. The binder contains a colloidal silica that has three specific characteristics. The first of these is that the colloidal silica is "peanut-shaped". Secondly, the colloidal silica has a primary particle diameter of from 10 to 100 nanometers. Thirdly, these primary particles make up secondary particles that have a diameter of 1.5 to 3.0 times that of the primary particles.

Applicants have discovered that the simultaneous selection of these three colloidal silica properties leads to a paper coating that simultaneously has good gloss, good absorption of both dye inks and pigment inks, and provides for good image clarity when used with both dye and pigment type inks.

The discussion concerning the obviousness rejections in this case center on what the secondary reference, Otani (US 2007/0036552), teaches regarding pigments for use in paper coatings. Applicants' views regarding the Otani reference can be summarized as follows:

1. Otani does not describe any colloidal silica meeting all three of applicant's characteristics. Otani at most describes a range of pigment materials that includes the colloidal silica of applicant's claims.

A. Otani describes a pigment having an average particle size of 30 to 500 nm. This corresponds to applicant's "secondary particle diameter", and will be referred to as such in the following discussion. The secondary particles may be made up from fine particles (corresponding to applicant's "primary" particles) that have a particle size range of from 5 to 60 nm, but may also be single particles.

B. By manipulating Otani's broadest range of average secondary particle size numbers and his "fine particle" size ranges, it is possible, from a mathematical point of view, to calculate a average ratio of secondary particle size to primary particle size in the range of from 0.5 (30/60) to 100 (500/5).

C. However, as has been pointed out before, a ratio of "0.5" makes no physical sense, as the secondary particle diameter cannot be less than the primary particle diameter.

D. Furthermore, the minimum theoretical ratio of secondary particle size to primary particle size (1.0) corresponds only to the case where the secondary particle and

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the primary particle are the same. This case is described in Otani only in Comparative Example 4. Otani's Comparative Example 4 falls outside of applicant's range of 1.5 to 3.0.

E. All other ranges obtained by manipulating Otani's secondary and primary particle size ranges fall outside of applicant's range of from 1.5 to 3.0, as follows:

Secondary Particle Size (cite)	Primary Particle Size (cite)	Ratio
30 nm (minimum end of broad range, [0018], 3 <sup>rd</sup> line)	5 nm (minimum end of range, [0020], 8 <sup>th</sup> line)	6.0
200 nm (minimum end of preferred range, [0018], 3 <sup>rd</sup> line)	5 nm (minimum end of range, [0020], 8 <sup>th</sup> line)	40.0
400 nm (maximum end of preferred range, [0018], 3 <sup>rd</sup> line)	5 nm (minimum end of range, [0020], 8 <sup>th</sup> line)	80.0
200 nm (minimum end of preferred range, [0018], 3 <sup>rd</sup> line)	60 nm (maximum end of range, [0020], 8 <sup>th</sup> line)	3.33
400 nm (maximum end of preferred range, [0018], 3 <sup>rd</sup> line)	60 nm (maximum end of range, [0020], 8 <sup>th</sup> line)	6.67
500 nm (maximum end of broad range, [0018], 3 <sup>rd</sup> line)	60 nm (maximum end of range, [0020], 8 <sup>th</sup> line)	8.33

F. Similarly, every one of Otani's examples (including comparatives) fall outside of applicant's range of from 1.5 to 3.0, as follows:

Example	Ratio
Ex. 1-6, 9-11, Comp. Ex. 1 and Comp. Ex. 2	$350/20 = 17.5$
Ex. 7	$250/10 = 25$
Ex. 8	$480/45 = 10.67$
Comp. Ex. 3	$390/8 = 48.75$
Comp. Ex. 4	$20/20 = 1.0$
Comp. Ex. 5	$240/20 = 12$

G. Therefore, there is no specific teaching in Otani of any colloidal silica having a ratio of secondary particle size to primary particle size of from 1.5 to 3.0, as required by applicant's claims.

H. Similarly, there is no specific teaching in Otani of a colloidal silica having both a secondary/primary particle size ratio of from 1.5 to 3.0 and a peanut-shaped configuration.

## 2. Otani teaches away from making the specific selection made by the applicants.

A. As already mentioned, Otani fails to describe any colloidal silica having a secondary/primary particle size ratio of from 1.5 to 3.0.

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B. Otani's preferred size ranges lead to a secondary/primary particle size ratio of at least 3.3 (200/60) and as high as 80 (400/5).

C. In every one of the examples of Otani's invention, the secondary/primary particle size ratio is 10.67 or higher.

D. Otani's preferred teachings and examples, therefore, would lead one to select a colloidal silica having a secondary/primary particle size ratio well in excess of applicant's range of 1.5 to 3.0.

E. The specific teaching in Otani that is closest to the applicant's invention (Comparative Example 4), shows poor results when the secondary/primary particle size ratio is 1.0. In this regard, please take note of Otani's Table 1, which reports "much" bleeding, low color density, a large amount of cracking, a significant problem with dusting and marginal image fastness.

3. The present application contains evidence of unexpected results that are achieved with the invention.

A. In the response filed in this case on October 5, 2006, applicants pointed out evidence of unexpected results that are obtained with this invention. This evidence is contained in part in Table 1, page 28 of applicant's specification.

B. During the telephonic interview of February 13, 2007, the undersigned reviewed that same evidence with the examiner.

C. That evidence was discussed yet a third time in the response that was filed in this case on February 27, 2007.

D. In no written communication during this time has the examiner either (a) acknowledged that such evidence has been presented nor (b) indicated any deficiency in the evidence that has been offered. The examiner is respectfully requested to do so if the outstanding rejections are to be maintained.

E. The unexpected results achieved with the present invention are evidenced in part by the data in Table 1, page 28 of applicant's specification. For purposes of this discussion, the Examiner's attention is directed to Example 2, Comparative Ex. 2 and Comparative Ex. 4. These are chosen because in each case the primary particle size is similar, the ratio of colloidal silica/vapor phase silica is constant, the amount is the same in each case and an undercoating layer is present in each case. In Example 2, the colloidal silica is peanut-shaped and the secondary/primary particle size ratio is 2.2. In Comparative

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Example 2, the colloidal silica is bead-shaped. The secondary/primary particle size ratio is 5.5-8.0. This falls within the values that can be calculated from Otani's preferred ranges, but is below (and therefore closer to the present invention than) any of Otani's examples. In Comparative Example 4, the colloidal silica is a spherical type in which the secondary/primary particle size ratio is 1.0. The particle size there is 20 nm. In fact, applicants' Comparative Example 4 matches up very well with Otani's Comparative Example 4, in which the secondary/primary particle size ratio is also 1.0 and the particle size is 10-20 nm.

F. The relevant portions of the application data for Example 2, Comparative Ex. 2 and Comparative Ex. 4 is reproduced here.

Ex. No.	Colloidal Silica Shape	Primary Particle Dia.	Secondary Particle Dia.	Secondary /Primary ratio	Gloss	Dry Ink Abs.	Pigment Ink. Abs	Image Clarity, dry ink	Image Clarity, pigment Ink
2	Peanut	23	51	2.2	○	○	○	○	⊙
C-2	Bead	18-25	100-200	5.5-8.0	Δ	○	○	X	Δ
C-4	Sphere	10-20	10-20	1.0	○	X	X	○	X

Here, ⊙ indicates the best properties, ○ the next best, Δ being worse still and X being worst of all.

G. This data shows the importance of the secondary/primary particle size ratio and also of having a peanut shape. When the ratio becomes large, and the peanut shape becomes lost, gloss and image clarity suffer. Note that Comparative Example 2 is closer to the present invention than is any specific Example of Otani's invention. Conversely, when the secondary/primary particle size ratio goes to zero, ink absorption is lost, as is image clarity with pigment ink.

H. Applicant's results square with Otani's reported data for their Comparative Example 4, which also reports a loss of ink absorption when a very similar colloidal silica is used. See Otani Table 1.

I. Table 3 of applicant's specification contains another useful comparison, this time between Example 18, Example 19, Comparative Example 10 and Comparative Example 13. Again, these are chosen for discussion here because the shape and secondary/primary particle size ratio are the significant differences between them. In Example 18, the colloidal silica is peanut-shaped, the primary particle size is 23 nm and the secondary/primary particle size ratio is 2.2. In Example 19, the colloidal silica is peanut-

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shaped and the secondary/primary particle size ratio is 2.3, but the primary particle size is a only 14 nm, a bit smaller than in Example 18. In Comparative Example 10, the colloidal silica is bead-shaped. The primary particle size is 22 nm and the secondary/primary particle size ratio is 5.2. In Comparative Example 13, the colloidal silica is a spherical type in which the secondary/primary particle size ratio is 1.0. The particle size there is 15 nm.

J. The relevant portions of the application data for Example 18, Example 19, Comparative Ex. 10 and Comparative Ex. 13 is reproduced here.

Ex. No.	Colloidal Silica Shape	Primary Particle Dia.	Secondary Particle Dia.	Secondary /Primary ratio	Gloss	Dry Ink Abs.	Pigment Ink. Abs	Image Clarity, dry ink	Image Clarity, pigment Ink
18	Peanut	23	51	2.2	○	○	○	○	○
19	Peanut	14	33	2.3	○	○	○	○	○
C-10	Chain	18-25	100-200	5.5-8.0	○	○	○	X	X
C-13	Sphere	10-20	10-20	1.0	○	X	Δ	○	○

As before, ink absorption is seen to suffer when the secondary/primary ratio falls to 1.0 (Comparative Example 13), and image clarity suffers when the ratio becomes too high (Comparative 10), even when the colloidal silica retains a chain shape.

K. Applicants maintain that the foregoing data is more than enough to establish the non-obviousness of their invention. Applicants stand ready to submit the foregoing data to the Office in the form of a declaration if the examiner deems it necessary.

L. The examiner takes the position that "the reference(s) teaches all of the claimed ingredients". However, that is not the case, as the references, Otani in particular, disclose no more than a broad genus of colloidal silicas without disclosure of the particular colloidal silica that is the subject of applicants' claims.

M. The examiner further states that "therefore, the claimed effects and physical properties, i.e., the value of specular gloss would implicitly be achieved [with the prior art]. This statement is disproved not only by the applicant's data, as discussed above, but even by the Otani reference itself. The Otani reference clearly describes significant changes in paper properties that result from changes in the colloidal silica, as illustrated, for example, by his Comparative Examples 3 and 4. What Otani does not do is teach or suggest to select applicant's particular colloidal silica, or suggest that anything good might come of that.

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4. Applicants' invention is clearly adequately disclosed and enabled.

A. On page 5 of the outstanding office action, the examiner asserts that if the applicants maintain that "the value of specular gloss would implicitly be achieved by a composition with all the claimed ingredients . . . (2) it would be the Office's position that the application contains inadequate disclosure as there is no teaching as to how to obtain the claimed properties with only the claimed ingredients."

B. Applicants have submitted a patent application with no fewer than 32 working examples that fall within the scope of the present claims.

C. The data presented in applicants' examples demonstrates precisely how to achieve the beneficial results that can be achieved with the invention. Moreover, the various examples and comparative examples more than adequately tie the compositional aspects of the invention to the beneficial results that are obtained.

D. There can be little doubt that the present invention is both described and enabled.

Conclusion

The present invention has been shown to be novel and unobvious for the reasons stated above. The examiner is requested to take note of the fact that the corresponding application has been granted in other major examining countries, including the EPO (1 609 609 B1), Japan (3699101) and Korea (5086469). The examiner is further requested to give due consideration to the experimental data that has been reviewed above, and in previous office actions, as that data plainly supports the patentability of the present claims.

A Notice of Allowance is respectfully requested.

Respectfully submitted  
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